

We claim:

1. A method of increasing or decreasing one or more of hair follicle development, tooth development, or sweat gland development, in a tissue, comprising altering EDA1-II activity in the tissue.
- 5 2. The method of claim 1, wherein method is a method of increasing or decreasing hair follicle development.
3. The method of claim 1, wherein method is a method of increasing or decreasing tooth development.
4. The method of claim 1, wherein method is a method of increasing or decreasing sweat
10 gland development.
5. The method of claim 1, wherein the method is a method of increasing one or more of hair follicle development, tooth development, or sweat gland development, in the tissue, by increasing EDA1-II activity in the tissue.
6. The method of claim 5, wherein increasing EDA1-II activity comprises administering an
15 EDA1-II nucleic acid or protein to the tissue, increasing EDA1-II expression in the tissue, or increasing EDA1-II sensitivity of the tissue.
7. The method of claim 6, wherein increasing EDA1-II sensitivity of the tissue comprises enhancing EDA1-II expression or activity in the tissue.
8. The method of claim 7, wherein enhancing EDA1-II expression in the tissue comprises
20 introducing into one or more cells of the tissue an expression vector encoding EDA1-II.
9. The method of claim 8, wherein the expression vector comprises a DNA sequence.
10. The method of claim 9, wherein the DNA sequence comprises a nucleic acid sequence having at least 70% identity to SEQ ID NO: 1, and which encodes a polypeptide that enhances EDA1-II activity in the tissue.
- 25 11. The method of claim 10, wherein the DNA sequence comprises a nucleic acid sequence having at least 80% identity to SEQ ID NO: 1 and which encodes a polypeptide that enhances EDA1-II activity in the tissue.
12. The method of claim 11, wherein the DNA sequence comprises a nucleic acid sequence having at least 90% identity to SEQ ID NO: 1 and which encodes a polypeptide that enhances EDA1-
30 II activity in the tissue.
13. The method of claim 11, wherein the DNA sequence comprises a nucleic acid sequence shown in SEQ ID NO: 1.
14. The method of claim 5, wherein increasing EDA1-II activity comprises administering DL or dl DNA or protein to the tissue, increasing DL or dl expression in the tissue, or increasing DL
35 or dl sensitivity of the tissue.
15. The method of claim 14, wherein increasing DL or dl sensitivity of the tissue comprises enhancing DL or dl expression or activity in the tissue.

16. The method of claim 15, wherein enhancing DL or dl expression in the tissue comprises introducing into one or more cells of the tissue an expression vector encoding DL or dl.

17. The method of claim 16, wherein the expression vector comprises a DNA sequence.

18. The method of claim 17, wherein the DNA sequence comprises a nucleic acid sequence
5 having at least 70% identity to SEQ ID NO: 12 or 18 and which encodes a polypeptide that enhances EDA1-II activity in the tissue.

19. The method of claim 18, wherein the DNA sequence comprises a nucleic acid sequence having at least 80% identity to SEQ ID NO: 12 or 18 and which encodes a polypeptide that enhances EDA1-II activity in the tissue.

10 20. The method of claim 19, wherein the DNA sequence comprises a nucleic acid sequence having at least 90% identity to SEQ ID NO: 12 or 18 and which encodes a polypeptide that enhances EDA1-II activity in the tissue.

21. The method of claim 20, wherein the DNA sequence comprises a nucleic acid sequence shown in SEQ ID NO: 12 or 18.

15 22. The method of claim 5, wherein increasing EDA1-II activity comprises administering an amount of EDA1-II protein to the tissue sufficient to promote one or more of hair follicle development, tooth development, or sweat gland development.

23. The method of claim 22, wherein the EDA1-II protein is a recombinant protein.

20 24. The method of claim 22, wherein the EDA1-II protein comprises an amino acid sequence having at least 95% identity to SEQ ID NO: 2 and which encodes a polypeptide that enhances EDA1-II activity in the tissue.

25. The method of claim 24, wherein the amino acid sequence comprises an amino acid sequence having at least 98% identity to SEQ ID NO: 2 and which encodes a polypeptide that enhances EDA1-II activity in the tissue.

25 26. The method of claim 25, wherein the amino acid sequence comprises an amino acid sequence shown in SEQ ID NO: 2.

27. The method of claim 5, wherein increasing EDA1-II activity comprises administering an amount of DL or dl protein to the tissue sufficient to promote one or more of hair follicle development, tooth development, or sweat gland development.

30 28. The method of claim 27, wherein the DL or dl protein is a recombinant protein.

29. The method of claim 27, wherein the DL or dl protein comprises an amino acid sequence having at least 80% identity to SEQ ID NO: 17 or 19 and which encodes a polypeptide that enhances EDA1-II activity in the tissue.

30. The method of claim 29, wherein the amino acid sequence comprises an amino acid
35 sequence having at least 90% identity to SEQ ID NO: 17 or 19 and which encodes a polypeptide that enhances EDA1-II activity in the tissue.

31. The method of claim 30, wherein the amino acid sequence comprises an amino acid sequence shown in SEQ ID NO: 17 or 19.

32. The method of claim 5, wherein increasing EDA1-II activity comprises administering a DL or dl specific binding agent to the tissue in an amount of sufficient to promote one or more of hair follicle development, tooth development, or sweat gland development.

5 33. The method of claim 32, wherein the DL or dl specific binding agent is a polyclonal antibody, monoclonal antibody or fragment of a monoclonal antibody.

34. The method of claim 1, wherein the method is a method of decreasing one or more of hair follicle development, tooth development, or sweat gland development, in a tissue by decreasing EDA1-II activity in the tissue.

10 35. The method of claim 34, wherein decreasing EDA1-II activity comprises administering an effective amount of an a EDA1-II antisense molecule, specific binding agent or antagonist, which decreases EDA1-II expression in the tissue, or decreases EDA1-II sensitivity of the tissue.

36. The method of claim 35, wherein decreasing the EDA1-II sensitivity of the tissue comprises decreasing EDA1-II expression or activity in the tissue.

15 37. The method of claim 36, wherein decreasing EDA1-II expression or activity in the tissue comprises introducing in the tissue an EDA1-II antisense molecule, an EDA1-II specific binding agent or an EDA1-II antagonist.

38. The method of claim 36, wherein decreasing EDA1-II expression or activity in the tissue comprises introducing in the tissue a sequence having at least 80% identity to SEQ ID NO: 17 or 19 and which encodes a polypeptide that reduces EDA1-II activity in the tissue.

20 39. The method of claim 38, wherein decreasing EDA1-II expression or activity in the tissue comprises introducing in the tissue a sequence consisting of amino acids 1-183 of SEQ ID NO: 17 and which reduces EDA1-II expression or activity in the tissue.

40. The method of claim 36, wherein decreasing EDA1-II expression or activity in the tissue comprises introducing in the tissue a DL or dl antagonist.

25 41. The method of claim 5, wherein the tissue is a tissue of a subject suffering from an ectodermal disease.

42. The method of claim 41, wherein the ectodermal disease is XLHED, autosomal HED, or alopecia.

30 43. The method of claim 34, wherein the method is a method of decreasing hair follicle development in a subject suffering from hirsutism.

44. A composition comprising a therapeutically effective amount of a polypeptide at least 95% identity to SEQ ID NO: 2, or at least 80% identity to SEQ ID NO: 17 or 19, and a pharmaceutically acceptable carrier.

35 45. The composition of claim 44, wherein the polypeptide is encoded by a nucleic acid at least 70% identity to SEQ ID NO: 1, 12, or 18 and a pharmaceutically acceptable carrier.

46. A composition comprising a therapeutically effective amount of an EDA1-II antagonist, a dl antagonist, a DL antagonist, a sequence consisting of amino acids 1-183 of SEQ ID NO: 17, or

an EDA1-II specific binding agent, a DL specific binding agent, or a dl specific binding agent and a pharmaceutically acceptable carrier.

47. The composition of claim 44, further comprising one or more other compounds which increase or decrease hair follicle development, tooth development, or sweat gland development in a tissue.

48. The composition of claim 47, wherein the tissue is the tissue of a subject suffering from an ectodermal disease.

49. An antisense oligonucleotide which:
hybridizes to an RNA or a plus strand of an EDA1-II nucleic acid, a dl nucleic acid, or a DL nucleic acid; and
reduces EDA1-II activity.

50. A composition comprising a therapeutically effective amount of the antisense oligonucleotide of claim 49, and a pharmaceutically acceptable carrier.

51. A method of screening for compounds which increase or decrease development of hair follicles, sweat glands, or teeth, by determining whether a test compound binds to a DL or dl receptor in a cell expressing the receptor.

52. The method of claim 51, further comprising:
transforming the cell with an expression vector comprising a nucleic acid encoding the DL or dl receptor;
culturing the transformed cell under conditions that allow expression of the DL or dl receptor;

assaying the transformed cell for binding of the test compound; and
determining whether the test compound binds to the DL or dl receptor with high specificity.

53. The method of claim 52 further comprising comparing an extent of binding of the test compound with an extent of binding of other compounds known to bind to the DL or dl receptor, wherein the additional compounds comprise naturally-occurring and synthetic DL or dl receptor agonists and antagonists.

54. The method of claim 53 wherein the other compound is an EDA1-II ligand.

55. The method of claim 54, wherein the EDA1-II ligand comprises a sequence having 95% identity to SEQ ID NO: 1.

56. The method of claim 51, wherein the test compound binds to the receptor with a K_D of less than about 10^{-6} M.

57. The method of claim 51, wherein the test compound is arranged in an array on a substrate.

58. The method of claim 51, further determining if the compound is an agonist or antagonist of the DL or dl receptor.